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BIOLOGICAL SOCIETY OF WASHINGTON

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BIOSYSTEMATICS OF CENTRAL AMERICAN SPECIES  
OF *CTENOCOLUM*, A NEW GENUS OF SEED  
BEETLES (COLEOPTERA: BRUCHIDAE)

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INTRODUCTION

This paper is the third in a series concerned with a group of related seed beetle genera predatory on leguminous plants in the New World tropics; see Kingsolver and Whitehead (in press) for a review of *Caryedes*, and Whitehead and Kingsolver (in press) for a review of *Gibbobruchus*. As in those papers, the major purpose is to make known the fauna of Central America in general and of Costa Rica in particular, in conjunction with ecological studies of the beetles and their host plants being conducted by D. H. Janzen.

In this paper, we treat only the species of *Ctenocolum* known from Mexico and Central America, an area including the northernmost part of the range of the genus. Two species groups are distinguished, each represented in this area by four species. Our respective contributions are as in our *Caryedes* paper, but with some nongenital drawings contributed by K. Conway and L. Heath.

*Materials and methods:* We studied about 250 specimens, most of which are deposited in the United States National Museum of Natural History, Washington (USNM). All American specimens of the host plant subtribe Lonchocarpinae (tribe Dalbergiae, family Fabaceae) in the United States National Herbarium were examined for additional data. Methods are as described previously (Kingsolver and Whitehead,

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in press; Whitehead and Kingsolver, in press). Distribution records are mapped for each species. Holotypes of the five species described as new in this paper are deposited in the USNM.

*Acknowledgments:* We again thank D. H. Janzen for providing reared Costa Rican material, for criticizing the manuscript, and for providing financial assistance from NSF grants GB-7819 and GB-35032X. Additional fresh material was provided by C. D. Johnson and M. Sousa. We are indebted also to P. M. Hammond for important notes on the type specimens of *C. salvini*.

Type material of previously described species belonging to *Ctenocolum* is housed in the British Museum (Natural History), London; Naturhistoriska Riksmuseum, Stockholm; and Zoological Museum, Moscow State University, Moscow. We thank the curators of these collections for allowing us to study their material.

Additional material was loaned by the following individuals and institutions: D. E. Bright, Canadian National Collection, Ottawa (CNC); H. R. Burke, Texas A&M University, College Station (TAMC); H. F. Howden, Carleton University, Ottawa (HFHo); C. D. Johnson, Northern Arizona University, Flagstaff (NAUF); H. Reichardt, Museu de Zoologia da Universidade, São Paulo (MZSP); and G. E. Wallace, Carnegie Museum, Pittsburgh (CarP).

#### TAXONOMY

##### *Ctenocolum*, new genus

*Type-species:* *Pachymerus tuberculatus* Motschoulsky 1874.

*Derivation of name:* The name *Ctenocolum* is derived from Greek: *Ktenos* = comb, + *Kolon* = leg, in reference to the comb-shaped pecten characteristic particularly of the type-species and its relatives.

*Diagnostic combination and relationships:* *Ctenocolum* is one of the American genera of Bruchinae with pronotum campaniform and gibbous, hind tibia arcuate, and external carina of hind femur obsolete or represented by row of teeth. We previously placed this genus (as the "*Caryedes*" *tuberculatus* group) in the "*Caryedes*" assemblage (Kingsolver and Whitehead, in press) in which the abdomen and pygidium lack glabrous polished areas and the antennal scrobe of the gena is as long as or longer than the width of the antennal fossa. Of the three genera placed in the "*Caryedes*" assemblage, *Meibomeus* and *Caryedes*

differ from *Ctenocolum* by having the synapomorphous condition of lateral lobes of male genitalia not deeply divided. Conversely, an increased number of teeth of the hind femoral pecten is synapomorphous for members of the genus *Ctenocolum*; either 6–10 teeth with second and following forming a crescentic profile or 8–16 teeth with second and following forming a linear profile. The hind tibial mucro is short, but is neither as short as in *Meibomeus* nor longer than apical width of tibia as in most *Caryedes*.

*Description:* Body robust; length from pronotum to pygidium 2.0–4.6 mm, about 1.5 times greater than maximum width; width across elytra 1.4–3.6 mm, nearly equal to maximum length of elytron. Head moderately elongate, strongly constricted behind eye, postocular lobe short. Eye prominent, larger in male than in female or not, interocular ratio about 0.12–0.24 in male, 0.15–0.24 in female; ocular sinus deep, 4–10 rows of facets behind sinus. Frons with median carina prominent, alutaceous, extended forward onto base of clypeus, triangularly expanded basally. Frontoclypeal region broad, pentagonal; sides parallel behind, convergent in front; distance from apex of clypeus to apex of superior lobe of eye not or slightly greater than length of eye from apex of superior lobe to base. Gena between base of mandible and antennal fossa about as long as width of antennal fossa, glabrous. Antenna of male extended to or beyond elytral humerus, outer articles transverse to elongate, eccentric to serrate or subflabellate; antenna of female extended to about elytral humerus, outer articles transverse to slightly elongate, moderately eccentric to serrate. Pronotum campaniform, sides shallowly and irregularly concave; median and lateral basal gibbosities low to moderately elevated, median sulcus shallow to moderately deep; median anterior gibbosities low, not or shallowly sulcate between; median basal lobe shallowly emarginate; lateral carina obsolete to distinct. Scutellum about square, bidentate or truncate. Intercostal process of prosternum narrow, acute. Metasternum shallow, broadly rounded in profile. Mesosternal lobe broad, flat, apex rounded or truncate. Elytra together subquadrate; striae deep, punctate; striae three and four strongly deflected laterad before base, abbreviated basally by high bidentate gibbosity; striae four and five abbreviated apically, coalescent or not; striae seven, eight, and nine limited basally by humeral gibbosity; interval nine flat to moderately convex apically, not carinate; disc convex. Front and middle legs slender, not sex-dimorphic, front coxae contiguous apically, middle coxae widely separated. Hind coxa densely punctate, middle third glabrous. Hind femur strongly swollen, external ventral margin finely dentate to coarsely dentate-carinate to base; ventral sulcus developed to or nearly to base, deep in apical half; internal ventral margin with two or more small teeth before pecten; pecten raised, either with 7–9 apical teeth separated from basal tooth by distinct gap, or with 12–16 evenly spaced teeth. Hind tibia strongly carinate, arcuate, flanged ventrally from near middle to mucro; mucro shorter than apical width of

tibia; external apical margin oblique or not, lateral coronal tooth sharply developed or not; hind basitarsus longer than four outer tarsal articles together. Abdominal sterna telescoped in male, last sternum emarginate, abdomen not otherwise sex-dimorphic; sterna without polished lateral areas. Pygidium various, without speculum, dimorphic or not in pattern. Male genitalia with median lobe broad, not fractured before apex, not strongly arcuate; internal sac various, with or without distinctive sclerites; lateral lobes broadly divided; median lobe with strap- or blade-like hinge sclerites; basal strut of tegmen narrow, with median keel; median lobe with characteristic patch of setae above apical orifice; basal hood of median lobe broad.

*Distribution:* *Ctenocolum* is restricted to tropical America including the West Indies, and is most diverse in species in Central America and northern South America. Eight species are known from Mexico and Central America; there probably are several additional species from this area. We recognize two species groups, each of which includes four of the Central American species.

*Remarks:* So far as known, larval *Ctenocolum* attack seeds of members only of the subtribe Lonchocarpinae (tribe Dalbergiae, family Fabaceae). No other bruchid genera are known to attack this group of plants. The only known host genera for species from Mexico and Central America are *Lonchocarpus* and *Piscidia*, but South American species occur in *Bergeronia* and *Muelleria* also. Pods of all of these plants are indehiscent, and beetles emerge through circular exits cut through the seed and pod walls.

#### KEY TO SPECIES OF *CTENOCOLUM* FROM MEXICO AND CENTRAL AMERICA

1. Pecten with 8–16 teeth, second and following linear in profile; hind tibial apex oblique or nearly so, lateral coronal tooth not distinguished from mucro by deep notch; internal sac of male genitalia with large distinctive sclerites (Tuberculatum Group) ..... 2.
- 1' Pecten with 6–10 teeth, second and following crescentic in profile; hind tibial apex with strong lateral coronal tooth distinguished from mucro by deep notch; internal sac of male genitalia without large sclerite (Crotonae Group) ..... 5.
- 2 (1). Eye with about 10 rows of facets behind sinus; external ventral denticles of hind femur greatly reduced; vestiture of pronotum and hind femur largely bright orange ..... 1. *Ctenocolum acapulcensis* n. sp.
- 2' Eye with about 3–6 rows of facets behind sinus; external ventral denticles of hind femur strongly developed; vestiture of pronotum and hind femur yellowish or whitish ..... 3.
- 3 (2'). Eye with about 3 rows of facets behind sinus; vestiture of elytral intervals two and three uniform from behind scutellum to midlength, in most specimens dark; female pygidium with

- contrasting longitudinal pattern .....  
 ..... 4. *Ctenocolum tuberculatum* (Motschoulsky).
- 3' Eye with about 6 rows of facets behind sinus; vestiture of elytral intervals two and three variegated behind scutellum; female pygidium without distinctive pattern ..... 4.
- 4 (3'). Dorsopaical angles of antennal articles 8-10 dark; sclerite of male endophallus not produced, with lateral hooks .....  
 ..... 3. *Ctenocolum salvini* (Sharp).
- 4' Antennal articles 8-10 uniformly colored externally, dark in most specimens; sclerite of male endophallus produced, without lateral hooks ..... 2. *Ctenocolum janzeni* n. sp.
- 5 (1'). Elytron (Fig. 5) with extensive whitish sutural maculation ..... 5. *Ctenocolum colburni* n. sp.
- 5' Elytron (Fig. 6-8) without extensive whitish sutural maculation ..... 6.
- 6 (5'). Apex of outer tooth of basal elytral gibbosity nearer to elytral base than to apex of inner tooth .....  
 ..... 6. *Ctenocolum biolleyi* n. sp.
- 6' Apex of outer tooth of basal elytral gibbosity nearer to apex of inner tooth than to elytral base ..... 7.
- 7 (6'). Base of notch between teeth of basal elytral gibbosity equidistant between elytral base and apex of inner tooth .....  
 ..... 7. *Ctenocolum martiale* n. sp.
- 7' Base of notch between teeth of basal elytral gibbosity nearer apex of inner tooth than elytral base .....  
 ..... 8. *Ctenocolum crotonae* (Fåhraeus).

## THE TUBERCULATUM GROUP

*Diagnostic combination:* The Tuberculatum Group is sharply distinguished from the Crotonae Group by the following characters of the hind leg and the male genitalia. Hind femur: pecten with 8-16 evenly spaced teeth, all teeth except first regular in profile. Hind tibia: lateral coronal tooth not sharply developed, not set off from mucro by deep emargination, apex oblique. Male median lobe: internal sac with large complex sclerite; ventral valve acute, sides not or barely sinuate.

Additional characteristics of the Tuberculatum Group are the following: eye of male enlarged in some species; ocular sinus shallow to deep, 3-10 rows of facets behind sinus; antenna of male flabellate in some species; lateral subbasal tubercles of pronotum moderate to strong; placement of outer tooth of basal elytral gibbosity not or slightly basad of inner tooth; and hind femur with external ventral series of denticles reduced in some species.

*Distribution:* Northern Mexico to northern South America. Four species are known from Mexico and Central America and are treated in this paper. We have examined specimens of three additional species from Colombia and Venezuela; all three are undescribed.

*Taxonomic notes:* This group is quite poorly known, as none of the species are represented by adequate numbers and samples. However, there are no evident taxonomic problems, as all the species are readily separable by characteristics of the male genitalia, especially by the form of the sclerite of the internal sac.

*Remarks:* Larvae of members of the Tuberculatum Group develop in seeds of *Lonchocarpus* and *Piscidia*. We suspect that the range of hosts for each species is limited. Only one species is known from more than one host species, and it is known from three closely related host species.

Little is known of flight activity. Specimens of two South American species were taken at black lights in February, and another specimen of one of them was collected in July.

### 1. *Ctenocolum acapulcensis*, new species

*Description of holotype male:* *Ctenocolum*, Tuberculatum Group. Length 4.6 mm. Width 3.2 mm. Integument largely dark rufous or rufopiceous, elytra largely piceous with rufopiceous variegation; antennal articles 3–10 infuscated, article 11 pale; front and middle legs and hind tarsus rufotestaceous. Vestiture variegated; pattern of dorsum (Fig. 1); bright orange on base of head, pronotum, mesepisternum, metepisternum, dorsal surfaces of all femora, and elytral intervals one and two; sparse and dark on most of elytra and hind tibia; pale or nearly white on most of pygidium, abdomen, and lower surface of hind femur. Head (Fig. 9); antenna flabellate (Fig. 16); eye large, interocular ratio about 0.15; ocular sinus shallow, 10 rows of facets behind sinus. Pronotum and elytra (Fig. 1); lateral subbasal gibbositities strongly developed. Hind leg (Fig. 24); pecten with about 12 teeth, first tooth not much larger than second; external ventral series of denticles much reduced. Pygidium (Fig. 31). Male genitalia (Fig. 43–44).

*Type material:* Holotype male, "Bot. N°226.", "Acapulco. Mex.", "Chittenden Collection", "MEX. Guerrero. Acapulco vic. X.1894-III.1895 E. Palmer #226", "*Lonchocarpus eriocarinalis* Micheli USNM Herb."; in United States National Museum of Natural History, Washington, type no. 72797.

Paratype, Costa Rica (Fig. 58), 1; in USNM. COSTA RICA. Guana- caste: 6 km. n. Bagaces, 3.XI.1970, D. H. Janzen #268, reared *ex Lonchocarpus eriocarinalis* Micheli, live adult extracted from seed 9.III.1971.

*Remarks:* *Ctenocolum acapulcensis* is named for the type locality. The only other bruchid species known from this host species is *C. martiale*, one specimen of which was found in the same herbarium specimen with the holotype of *C. acapulcensis*.

*Ctenocolum acapulcensis* is the only Central American member of the genus with male antenna flabellate and with external ventral denticles of hind femur nearly obsolete. An undescribed South American species

is closely related but differs conspicuously by having only about 8 teeth in the femoral pecten and by having whitish rather than bright orange dorsal vestiture.

## 2. *Ctenocolum janzeni*, new species

*Description:* *Ctenocolum*, Tuberculatum Group. Length 3.3–3.8 mm. Width 2.1–2.4 mm. Integument largely rufopiceous, elytra largely piceous with rufopiceous variegation; antenna rufotestaceous, outer surfaces of articles 8–10 infuscated; base of head with bilobate piceous mark; front and middle femora mottled, front and middle legs otherwise rufotestaceous; hind tarsus rufous. Vestiture variegated; pattern of dorsum (Fig. 2); nearly white on most of pygidium and abdomen; light tan on mesepisternum, metepisternum, dorsal surface of hind femur; dark tan or orange brown on much of pronotum and in elytral variegation. Head (Fig. 11); antenna not flabellate (Fig. 17); eyes large, sex-dimorphic, interocular ratio about 0.17 in male and 0.23 in female; ocular sinus deep, 6 rows of facets behind sinus. Pronotum and elytra (Fig. 2); lateral subbasal gibbositities moderately developed. Hind leg (Fig. 26); pecten with 13–16 teeth, first tooth much larger than second and following; external ventral denticles of hind femur strongly developed. Pygidium (Fig. 34). Male genitalia (Fig. 45–47).

*Type material:* Holotype male, "C.R. Puntarenas Prov., 4 mi. n. jct. to Puntarenas 6.III.1972 DHJanzen", "reared ex *Piscidia* fruits, em. by 20.VI.1972 CODE: VI-20-1972-X"; in United States National Museum of Natural History, Washington, type no. 72798.

Paratypes, Mexico to Costa Rica (Fig. 57); 8; in CarP, CNC, USNM. MEXICO. Jalisco: Guadalajara, McConnell. Oaxaca: Carrizal, 25.XII.1940, F. Miranda #1043 (MEXU), ex herbarium specimen of *Piscidia grandifolia* (Donn. Sm.) I. Johnst. San Luis Potosi: El Salto de Agua, 28-30.VII.1960, H. Howden. Sinaloa: no locality specified, M. Narvaez M. & A. E. Salazar #3129 (US), ex herbarium specimen of *Piscidia mollis* Rose. SONORA: Ciudad Obregón, 29.IX.1933, H. S. Gentry #305M (US), ex herbarium specimen of *Piscidia mollis* Rose; Torres, 10.II.1903, F. V. Coville #1659 (US), ex herbarium specimen of *Piscidia mollis* Rose. Tamaulipas: 20 mi. n. Nuevo Morelos, 3.VII.1954, D. G. Kissinger. COSTA RICA. Puntarenas: 4 mi. n. jct. to Puntarenas, 6.III.1972, D. H. Janzen #VI-20-1972-X, reared ex *Piscidia carthagenesis* Jacq., emerged by 20.VI.1972.

*Remarks:* *Ctenocolum janzeni* is named for D. H. Janzen, collector of the holotype.

We report *C. janzeni* from three species of *Piscidia* and suspect that it also attacks seeds of the other Mexican and Central American *Piscidia* species. Various other *Ctenocolum* attack *Piscidia* in South America and the West Indies, and Janzen reared *C. crotonae* from the same plant that produced the holotype and a paratype of *C. janzeni* in Costa Rica.

3. *Ctenocolum salvini* (Sharp), new combination

*Bruchus salvini* Sharp 1885:446. Type-locality: Capetillo, Sacapetequez, Guatemala. Type-depository: British Museum (Natural History), London.

*Pseudopachymerus salvini*: Pic 1913:12.

*Caryedes salvini*: Blackwelder 1946:758.

*Remarks*: We have no host records for this species. Only the type specimens from Capetillo (Fig. 58) are known and we are unable to give a full redescription. The bright coppery vestiture (see Sharp 1885, pl. 26, Fig. 5) is distinctive. Head: bilobate dark mark at base as in *C. janzeni*; antenna (Fig. 18) not flabellate, articles 8–10 infuscated only at apical angles; eye large and ocular sinus deep, not or slightly sex-dimorphic, ocular ratio about 0.18–0.20; ocular sinus deep, 6 rows of facets behind sinus. Hind leg: pecten with about 12 teeth as in *C. tuberculatum*, first tooth much larger than second and following; external ventral denticles of femur strong. Pygidium: pattern not sex-dimorphic. Male genitalia (Fig. 39–42). The pattern of elytral vestiture is strongly variegated as in *C. janzeni*, but differs from the pattern of both *C. janzeni* and female *C. tuberculatum* in that the post-scutellar dark macula is widely broken by the pale vestiture of intervals one and two.

4. *Ctenocolum tuberculatum* (Motschoulsky), new combination

*Pachymerus tuberculatus* Motschoulsky 1874:244; Sharp 1885:440 (as synonym of *B. longicollis* Fähræus but “. . . will prove to be one of the varieties of this species”). Type-locality: Panama. Type-depository: Zoological Museum, Moscow State University, Moscow.

*Pseudopachymerus longicollis* var. *tuberculatus*: Pic 1913:11.

*Caryedes longicollis* var. *tuberculata*: Blackwelder 1946:758.

*Bruchus serratissimus* Sharp 1885:443. Type-locality: Paso Antonio, Escuintla, Guatemala. Type-depository: British Museum (Natural History), London. New synonymy.

*Pseudopachymerus serratissimus*: Pic 1913:12.

*Caryedes serratissima*: Blackwelder 1946:758.

*Description*: *Ctenocolum*, Tuberculatum Group. Length 2.5–3.9 mm. Width 1.7–2.3 mm. Integument largely dark rufous or rufopiceous, dorsum with some piceous variegation; antennal articles 8–10 strongly infuscated externally, articles 4–7 slightly infuscated; front and middle femora faintly banded, front and middle legs and hind tarsus rufotestaceous. Vestiture of dorsum (Fig. 3–4) and pygidium (Fig. 32–33) sex-dimorphic, pattern more strongly developed in female; black brown dorsally in median maculations of pronotum, elytra, and pygidium of female, paler in male; tan or orange brown most of rest of dorsum; whitish ventrally. Head (Fig. 10); antenna (Fig. 19–20) not flabellate; eyes large, not sex-dimorphic, interocular ratio 0.21–0.24; ocular sinus



deep, 3 rows of facets behind sinus. Pronotum and elytra (Fig. 3-4); lateral subbasal gibbosities moderately developed. Hind leg (Fig. 25); pecten with about 12 teeth, first tooth much longer than second and following; external ventral denticles of hind femur strongly developed. Pygidium (Fig. 32-33). Male genitalia (Fig. 48-50).

*Material examined:* Mexico to Costa Rica (Fig. 59) and Venezuela, 110. MEXICO. Jalisco: 34 mi. nw. Barra de Navidad, 9.III.1973, C. D. Johnson #438-73, reared *ex* ?*Lonchocarpus*, emerged by 22.III-13.VI. 1973. Yucatán: Mérida, 24.VII.1944, N. Souza, through G. N. Wolcott 44-19729, *ex* *Lonchocarpus longistylus* Pittier. COSTA RICA. Guanacaste: Cañas area, 2.II.1969, D. H. Janzen, reared *ex* *Lonchocarpus*: 7 km. n. Cañas, 6.II.1970, D. H. Janzen reared *ex* *Lonchocarpus*; La Pacifica, 7 km. n. Cañas, 2.III.1972, D. H. Janzen #VI-20-1972-XXV, reared *ex* *Lonchocarpus*, emerged by 20.VI.1972; 1.3 mi. e. Playa Coco, 3.XII.1970, D. H. Janzen #307, reared *ex* *Lonchocarpus costaricensis* Donn. Sm.; Santa Rosa, 15.III.1972, D. H. Janzen #VI-19-1972-XXVIII, reared *ex* *Lonchocarpus*, emerged by 19.VI.1972. VENEZUELA. Aragua: 45 km. e. Sombrero, 30.I.1964, W. H. Cross, "cultivated cotton."

*Remarks:* Specimens of *Ctenocolum tuberculatum* are readily distinguished from specimens of *C. acapulcensis*, *C. janzeni*, and *C. salvini* by having only 3 facet rows behind the ocular sinus rather than 6 or more. We have examined specimens of two closely related species from Colombia and Venezuela which agree in eye structure but differ in structure of the sclerite of the internal sac of the male genitalia and, in at least one of these two species, lack of dark median stripe on female pygidium.

#### THE CROTONAE GROUP

*Diagnostic combination:* The Crotonae Group is well distinguished from the Tuberculatum Group by each of the following characteristics. Hind femur: pecten with 6-10 teeth, teeth from second of series to last gradually increased in size to middle then decreased to apex. Hind tibia: lateral coronal tooth sharply developed, set off from mucro by deep emargination. Male median lobe: internal sac without large complex sclerite; ventral valve truncate, sides strongly sinuate.

Further characteristics of the Crotonae Group include the following: eyes not sex-dimorphic; ocular sinus deep, 4-5 rows of facets behind sinus; antenna not sex-dimorphic, or male antenna elongate; lateral subbasal gibbosities of pronotum weak to moderate; placement of outer tooth of basal elytral gibbosity well basad of inner tooth; and hind femur with external ventral series of denticles strong in all species.

*Distribution:* Northern Mexico to southern South America, and West Indies. Four species are known from Mexico and Central America and are treated in this paper. At least two Central American species extend to South America. Several additional species occur in South America and the West Indies.

*Taxonomic notes:* Though this group is less poorly known than the

Tuberculatum Group, various taxonomic problems are evident. The four known Central American species are separable from one another without difficulty, but southern limits for one of them, *C. crotonae* are uncertain. The name *Bruchus podagricus* Fabricius (1801) pertains, we think, to a closely related West Indian form; type material of this form (in Copenhagen) needs to be studied further. Several other South American forms are also closely related, and indeed may not be distinct from *C. crotonae*.

*Remarks:* Larvae of species of the Crotonae Group devour seeds of *Bergeronia*, *Lonchocarpus*, *Muelleria*, and *Piscidia*. The host ranges for at least some of the species are rather broad. Three of the known Central American species are known from two or more species of *Lonchocarpus*, and one of them is known also from *Piscidia*.

We know little about adult activity. One specimen of a Brazilian form was taken at a light trap in January. Other specimens of South American and West Indian forms were collected at various times throughout the year.

##### 5. *Ctenocolum colburni*, new species

*Description:* *Ctenocolum*, Crotonae Group. Length 2.5–2.8 mm. Width 1.6–1.9 mm. Integument largely rufous; dorsum of head, anterior median portion of pronotal disc, and outer two-thirds of elytron piceous; hind tibia rufopiceous; antennal articles 1–5 partly and articles 6–11 wholly infuscated externally; front and middle legs testaceous. Vestiture mixed black and white, variegated in density; black only on dorsal surface as shown, characteristic (Fig. 5). Head (Fig. 13); antennal form as in *C. crotonae* (Fig. 21–22); eyes large, interocular ratio about 0.18–0.19; ocular sinus deep, 5–6 rows of facets behind sinus. Pronotum and elytra (Fig. 5); lateral subbasal gibbositities of pronotum nearly obsolete; basal elytral gibbositities displaced far behind base, paired teeth of each relatively small and proximate. Hind leg (Fig. 27); pecten with about 6 teeth, wide gap between first and second. Pygidium (Fig. 36). Male genitalia (Fig. 51–52).

*Type material:* Holotype male, "HOND. Cuyamel 17.VIII.1924 MACarleton," "*Lonchocarpus pentaphyllus* (Poir.) D. C. USNM herb.;" in United States National Museum of Natural History, Washington, type no. 72800.

Paratypes, Mexico to Costa Rica (Fig. 62), 8; in USNM. MEXICO. Veracruz: Coyame, Lake Catemaco, 14.VII.1971, Clark *et al.* GUATEMALA. Chimaltenango: road between Chimaltenango and San Martín Jilotepeque 1500–1900', along stream, 25.XI.1938, P. C. Standley #57907 (NY), *ex* herbarium specimen of *Lonchocarpus purpureus* Pittier. HONDURAS. Colón: Cuyamel, 17.VIII.1924, M. A. Carleton #634 (US), *ex* herbarium specimen of *Lonchocarpus pentaphyllus* (Poir.) DC. COSTA RICA. Heredia: San Miguel, 20.III.1971, D. H. Janzen #656, reared *ex* *Lonchocarpus velutina* Benth.

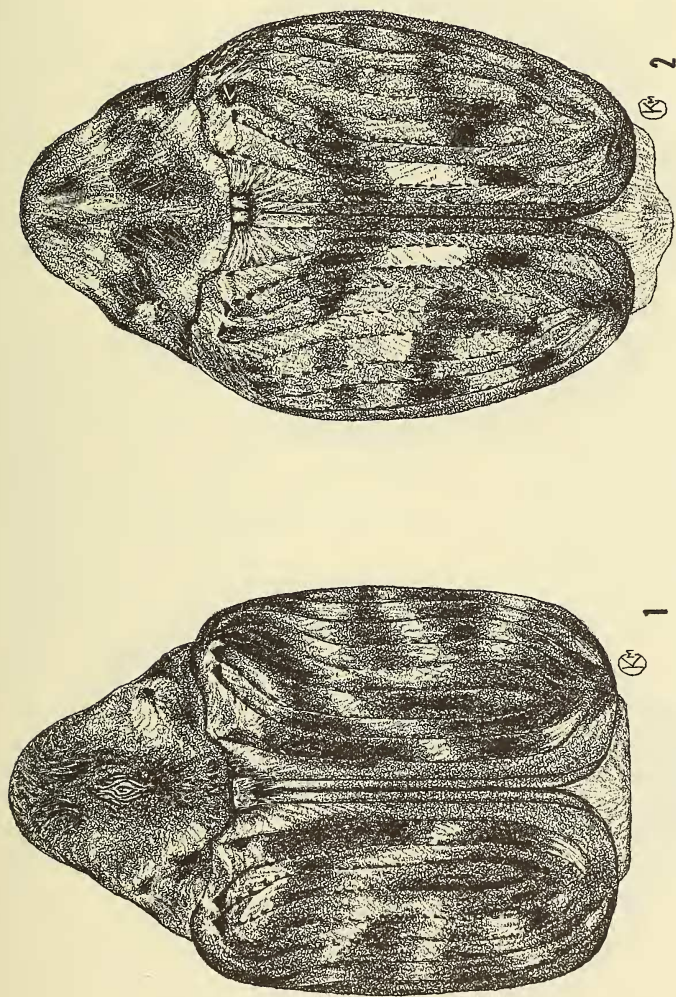


PLATE I. FIG. 1-2, *Ctenocolum* spp., habitus. 1, *C. acapulcensis*; 2, *C. janzeni*.

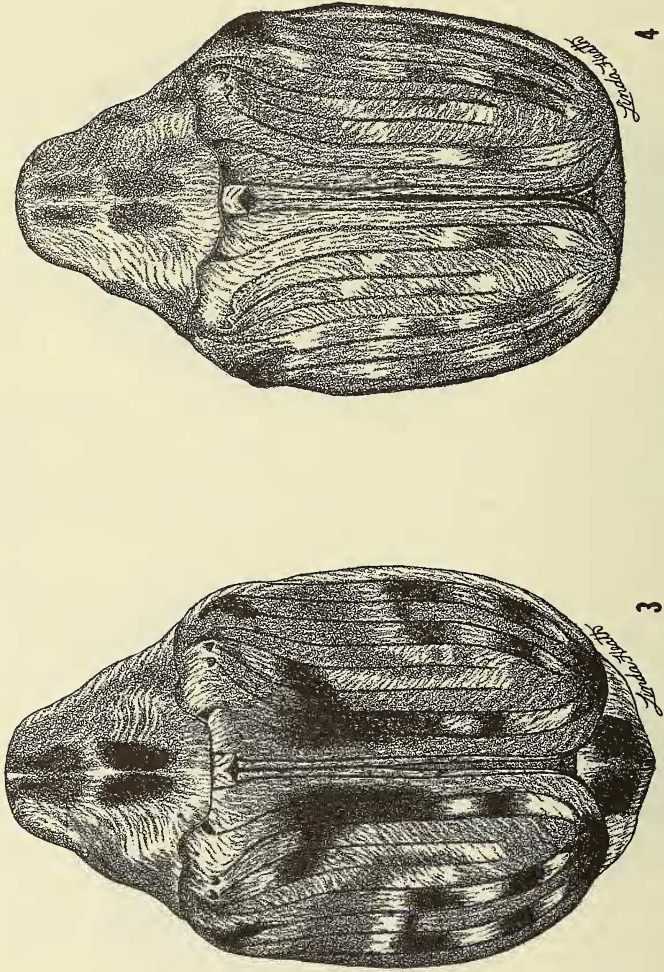


PLATE 2. FIG. 3-4, *Ctenocolum tuberculatum*, habitus: 3, female; 4, male.

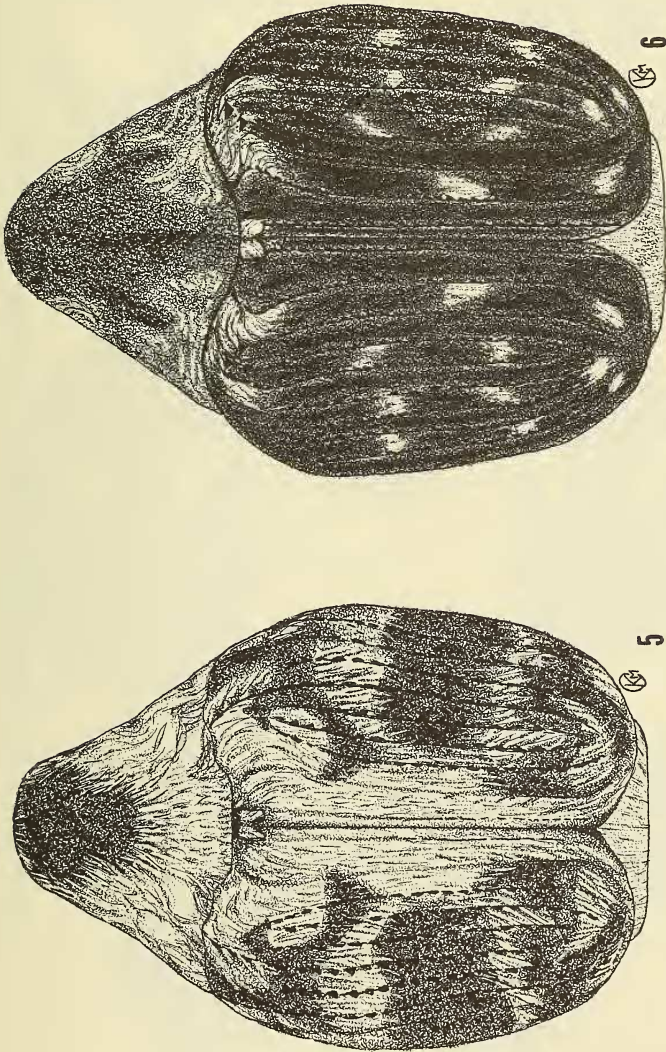


PLATE 3. FIG. 5-6, *Ctenocolium* spp., habitus: 5, *C. colburni*; 6, *C. martiale*.

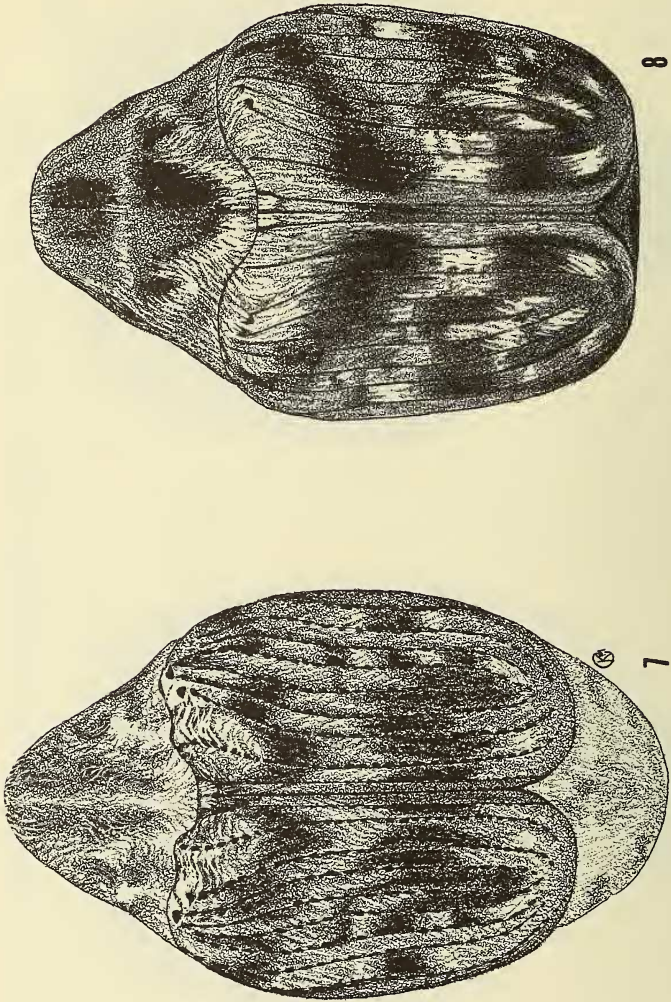


PLATE 4. FIG. 7-8, *Ctenocolum* spp., habitus: 7, *C. biolleyi*; 8, *C. crotonae*.

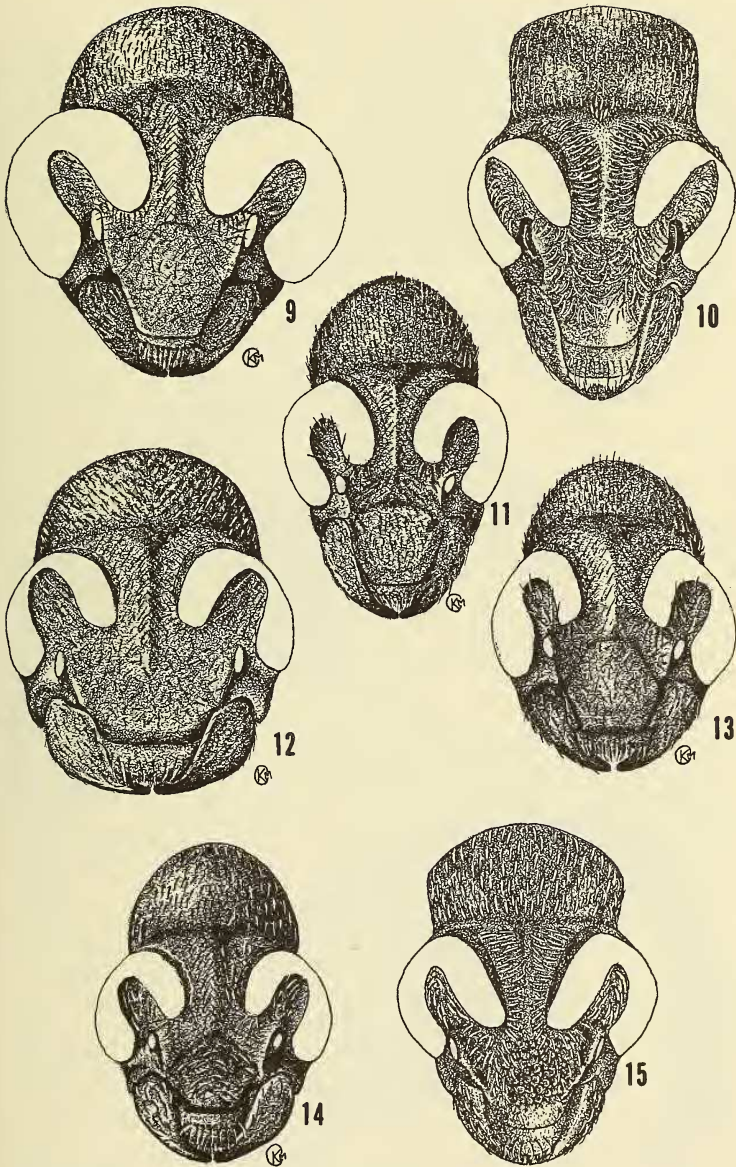


PLATE 5. FIG. 9-15, *Ctenocolum* spp., head: 9, *C. acapulcensis*; 10, *C. tuberculatum*; 11, *C. janzeni*; 12, *C. martiale*; 13, *C. colburni*; 14, *C. biolleyi*; 15, *C. crotonae*.

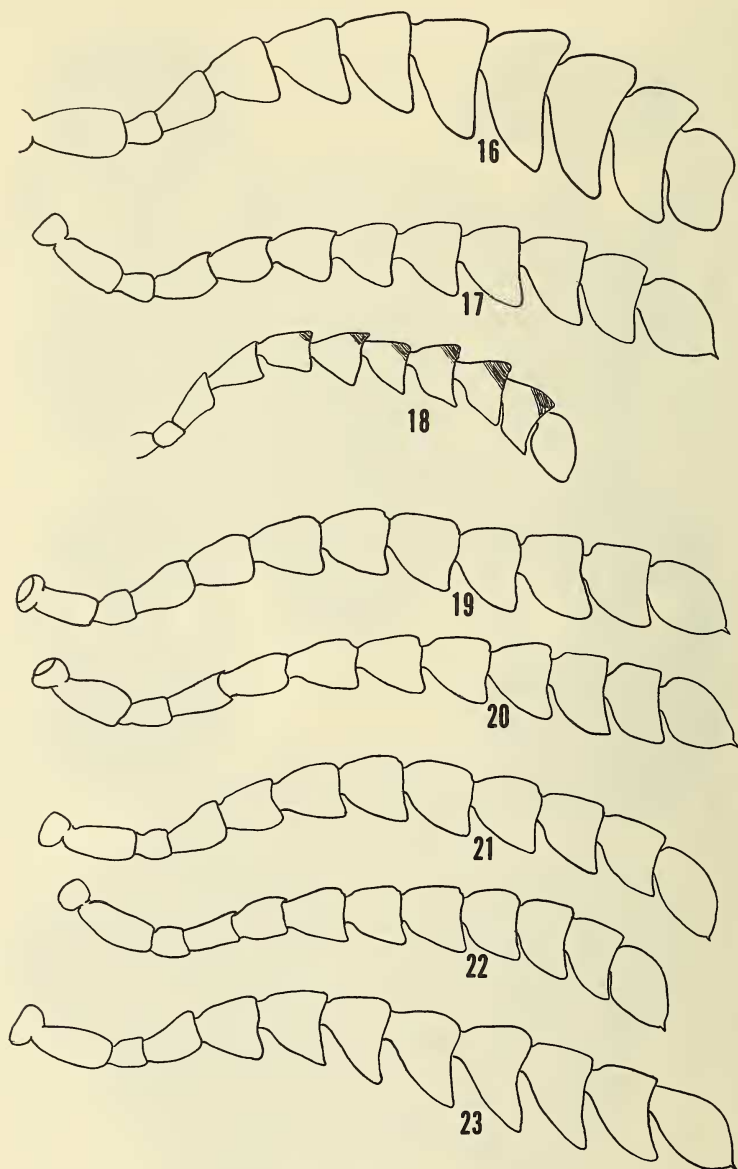
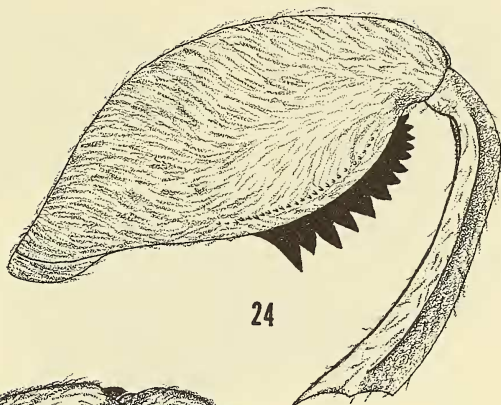
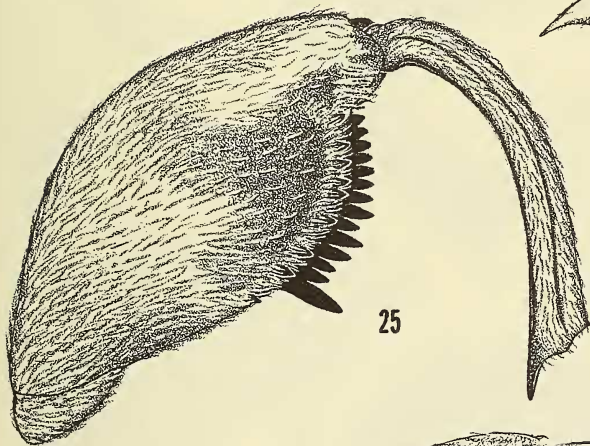


PLATE 6. FIG. 16-23, *Ctenocolum* spp., antenna: 16, *C. acapulcensis*, male; 17, *C. janzeni*, male; 18, *C. salvini*, male; 19, *C. tuberculatum*, male; 20, same, female; 21, *C. crotonae*, male; 22, same, female; 23, *C. martiale*, male.

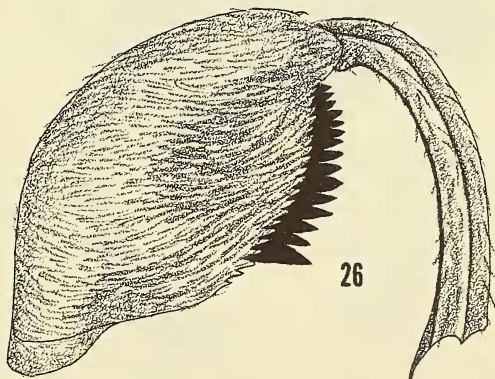




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PLATE 7. FIG. 24-26, *Ctenocolum* spp., hind leg: 24, *C. acapulcensis*; 25, *C. tuberculatum*; 26, *C. janzeni*.

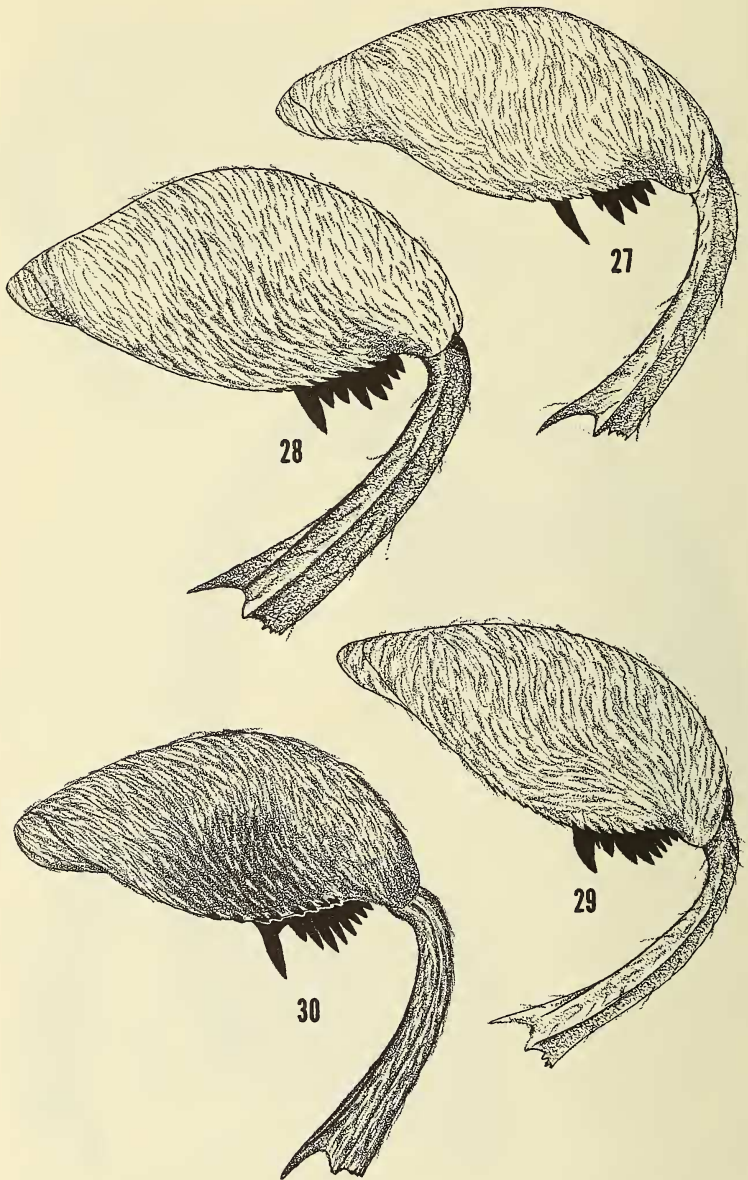


PLATE 8. FIG. 27-30, *Ctenocolum* spp., hind leg: 27, *C. colburni*; 28, *C. martiale*; 29, *C. biolleyi*; 30, *C. crotonae*.

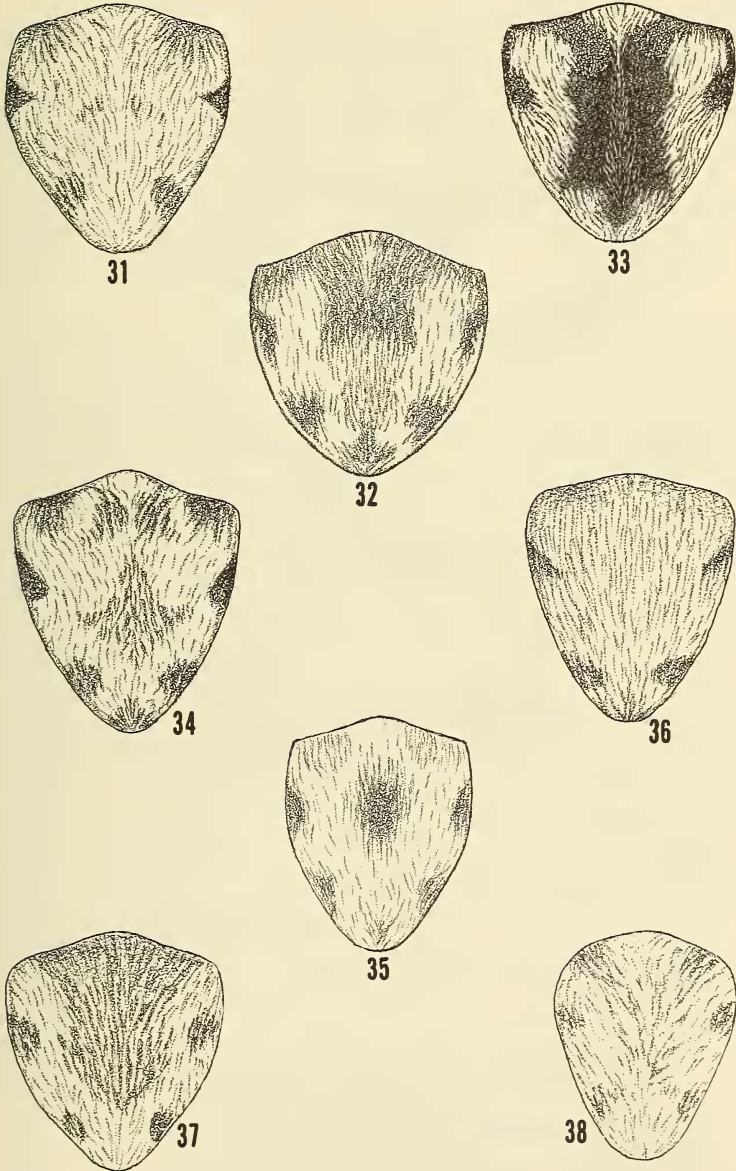
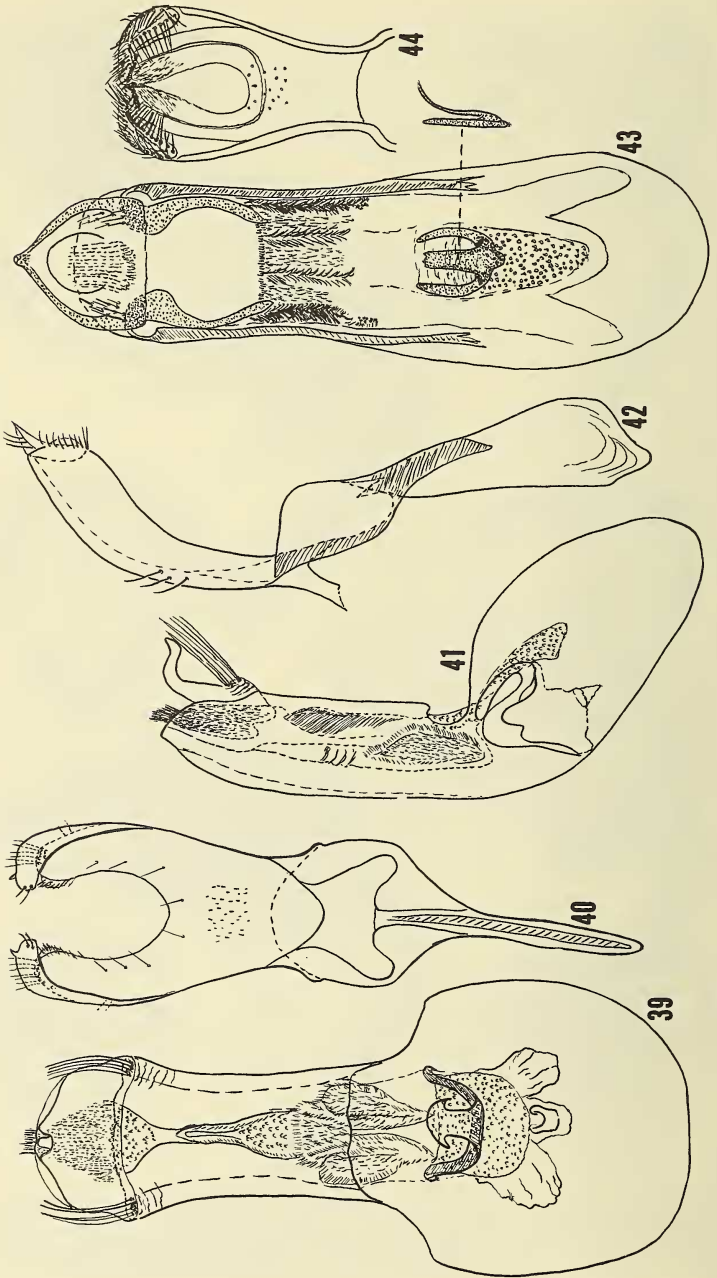


PLATE 9. FIG. 31-38, *Ctenocolum* spp., pygidium: 31, *C. acapulcensis*; 32, *C. tuberculatum*, male; 33, same, female; 34, *C. janzeni*; 35, *C. crotonae*; 36, *C. colburni*; 37, *C. martiale*; 38, *C. biolleyi*.



*Remarks:* *Ctenocolum colburni* is named to honor John Colburn Bridwell's outstanding contributions to knowledge of the Bruchidae.

This particularly handsome species is immediately distinguishable from all other members of the genus by the color pattern. No other Central American species is closely related. An undescribed South American species has similar elytral and pronotal gibbosities, femoral pecten, and male genitalia but lacks a dark spot on the pronotum and has a more diffuse elytral pattern. This undescribed species is represented in USNM material by a long series from Guyana labelled as from *Muelleria* seeds; this host record needs confirmation.

#### 6. *Ctenocolum biolleyi*, new species

*Description of female:* *Ctenocolum*, Crotonae Group. Length 4.4 mm. Width 2.8 mm. Integument largely dark rufous, pronotum and elytra with piceous maculation; (antennal color not known); front and middle legs rufotestaceous. Vestiture variegated; mostly pale tan on venter, pleura, and pygidium; elytra and central part of pronotal disc variegated mostly with brown orange and black (Fig. 7). Head (Fig. 14); (antennal form not known); eyes large, interocular ratio about 0.23; ocular sinus deep, 5 rows of facets behind sinus. Pronotum and elytra (Fig. 7); lateral subbasal gibbosities of pronotum moderate; basal elytral gibbosities not displaced far behind base, paired teeth of each large, outer tooth much nearer to base than to inner tooth. Hind leg (Fig. 29); pecten with about 10 teeth, no gap between first and second but second minute. Pygidium (Fig. 38).

The male of this species is unknown.

*Type material:* Holotype female, "San Jose Costa Rica," "P. Biolley Collector," "Buchus? Teosite (*Rheana luxurians*"); [sic], "Chittenden Collection"; in United States National Museum of Natural History, Washington, type no. 72801.

Paratype, Costa Rica (Fig. 58), 1; in USNM. COSTA RICA. San Jose: San Jose, P. Biolley.

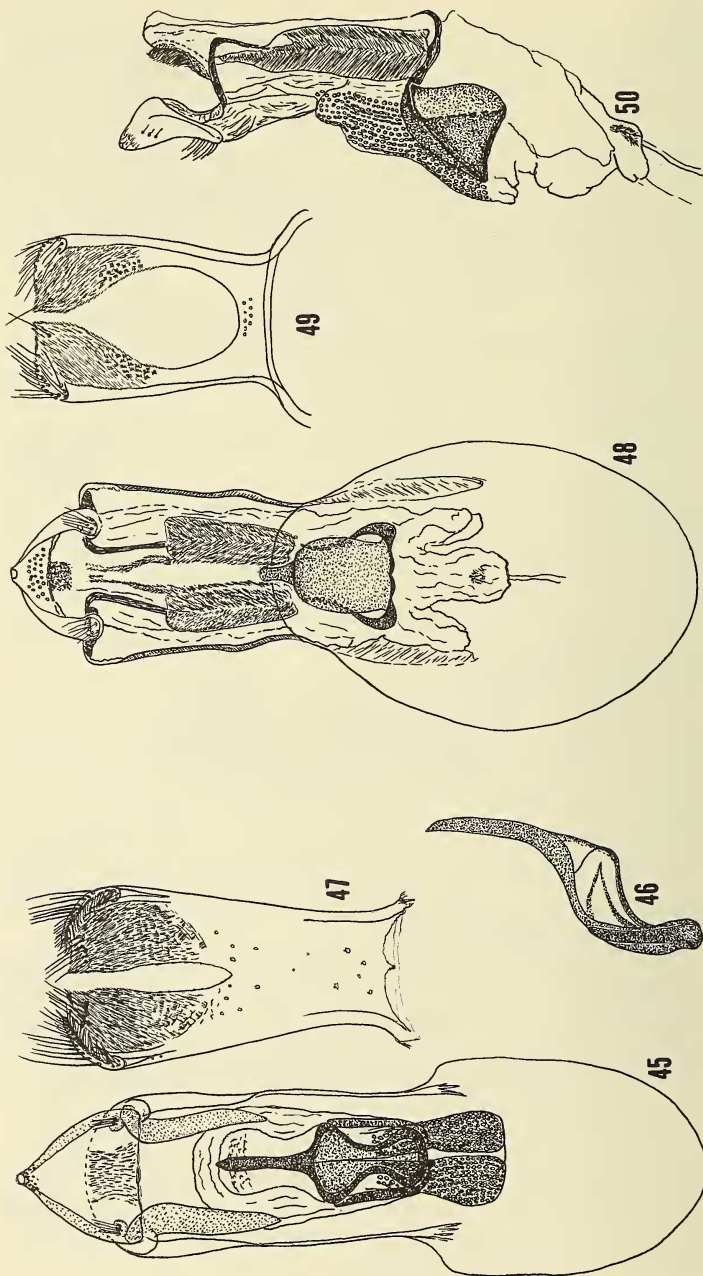
The holotype lacks the head, and the paratype lacks the elytra. Measures of length and width are based on the holotype and of interocular ratio on the paratype.

*Remarks:* *Ctenocolum biolleyi* is named for Paul Biolley, whose turn-of-the-century collections contributed greatly to knowledge of Costa Rican invertebrates. This species, the largest of the Crotonae Group, is related to *C. crotonae* and *C. martiale* but differs markedly from both by the peculiar positioning of the teeth of the basal elytral gibbosities.

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PLATE 10. FIG. 39-44, *Ctenocolum* spp., male genitalia: 39, *C. salvini*, median lobe; 40, same, lateral lobes; 41, same, median lobe, lateral aspect; 42, same, lateral lobes, lateral aspect; 43, *C. acapulcensis*, median lobe; 44, same, lateral lobes.



7. *Ctenocolum martiale*, new species

*Description:* *Ctenocolum*, Crotonae Group. Length 2.6–4.4 mm. Width 2.0–2.6 mm. Integument largely piceous above, dark rufous or rufopiceous below; antenna externally with articles 4–10 piceous and other articles infuscated in male, and with articles 4–10 but slightly infuscated in female; front and middle legs and hind tarsus rufous in male and with front and middle femora and tibiae extensively infuscated, much paler in female. Vestiture sex-dimorphic, variegated; dorsum (Fig. 6) with orange brown and black pattern on pronotum, and with elytra almost wholly black except for orange brown in scutellar region and small white areas (male) or with extensive orange brown and white variegation (female); pygidium light orange brown basally, light tan apically; mesepisternum, metepisternum, and dorsum of hind femur light orange brown; venter white, sparse. Head (Fig. 12); antenna (Fig. 23) serrate, extended to about elytral humerus in female and to about elytral basal third in male; eyes large, interocular ratio 0.21–0.23; ocular sinus deep, 4–5 rows of facets behind sinus. Pronotum and elytra (Fig. 6); lateral subbasal gibbositities of pronotum moderate; basal elytral gibbositities not displaced far behind base, paired teeth of each large, outer tooth about as close to base as to inner tooth. Hind leg (Fig. 28); pecten with about 8 teeth, no gap between first and second but second much smaller. Pygidium (Fig. 37). Male genitalia (Fig. 53–54).

*Type material:* Holotype male, "ex *Lonchocarpus cruentus* Lundell M. Sousa #3353," "MEX. Ver. Laguna del Majahual, Los Tuxtlas, 100 m. 30 Nov. 1967"; in United States National Museum of Natural History, Washington, type no. 72799.

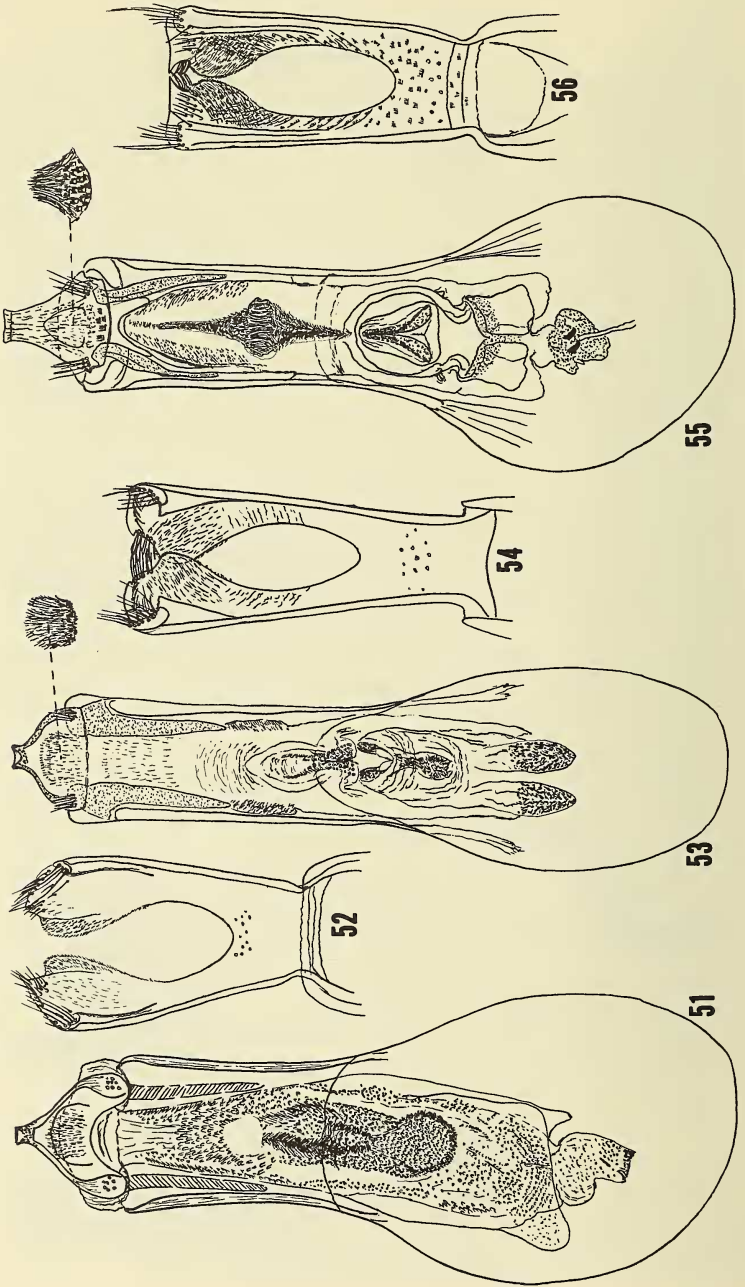
Paratypes, Mexico (Fig. 61) and Trinidad, 13; in CNC, USNM. MEXICO. Guerrero: Acapulco, X.1894-III.1895, E. Palmer #589 (US), ex herbarium specimen of *Lonchocarpus constrictus* Pittier; Acapulco, X.1894-III.1895, E. Palmer #226 (US), ex herbarium specimen of *Lonchocarpus eriocarinalis* Micheli. Oaxaca: Loma del Chivo, 50 m., Chiltepec, Tuxtepec, 9.V.1968, M. Sousa #3664, ex herbarium specimen of *Lonchocarpus cruentus* Lundell. Veracruz: Laguna del Majahual, 100 m., Los Tuxtlas, 30.XI.1967, M. Sousa #3353, ex herbarium specimen of *Lonchocarpus cruentus* Lundell. TRINIDAD. 3 mi. w. Mayaro, 14.VIII.1969, H. & A. Howden.

*Remarks:* We name this species, which destroys seeds of *Lonchocarpus*, after Mars, the Roman god of war: from Latin, "*Martialis*" =

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PLATE 11. FIG. 45–50, *Ctenocolum* spp., male genitalia: 45, *C. janzeni*, median lobe; 46, same, sclerite of endophallus, lateral aspect; 47, same, lateral lobes; 48, *C. tuberculatum*, median lobe; 49, same, lateral lobes; 50, same, endophallus, lateral aspect.





"of Mars." We dedicate *Ctenocolum martiale* to Mario Sousa, who in the course of studies of *Lonchocarpus* provided us with important material of this and other species of *Ctenocolum*.

8. *Ctenocolum crotonae* (Fåhraeus), new combination

*Bruchus crotonae* Fåhraeus 1839:123. Type-locality: Brazil. Type-depository: Naturhistoriska Riksmuseum, Stockholm.

*Pseudopachymerus crotonae*: Pic 1913:10.

*Caryedes crotonae*: Blackwelder 1946:758.

*Bruchus pictifemur* Sharp 1885:446. Type-locality: Jalapa, Veracruz, Mexico. Type-depository: British Museum (Natural History), London. New synonymy.

*Pseudopachymerus pictifemur*: Pic 1913:11.

*Caryedes pictifemur*: Blackwelder 1946:758.

*Description*: *Ctenocolum*, Crotonae Group. Length 2.0–3.4 mm. Width 1.4–2.0 mm. Integument and vestiture color and variegation much as in *C. martiale* except that sex-dimorphism is much less developed (most strongly in South America); integument of males and females varied from largely rufous to largely piceous; antennae in most specimens not strongly infuscated; pygidium in some specimens with vestiture orange brown nearly to apex. Head (Fig. 15); antenna (Fig. 21–22) serrate, extended to about elytral humerus in female and to about basal third of elytron in male; eyes large, interocular ratio 0.17–0.20; ocular sinus deep, 4–5 rows of facets behind sinus. Pronotum and elytra (Fig. 8); lateral subbasal gibbosities of pronotum moderate; basal elytral gibbosities not displaced far behind base, paired teeth of each large, outer tooth closer to inner tooth than to base. Hind leg (Fig. 30); pecten with 7–9 teeth, no gap between first and second but second much smaller. Pygidium (Fig. 35). Male genitalia (Fig. 55–56).

*Ctenocolum crotonae* is distinguished from the related *C. martiale* by the male genitalia, with conspicuous differences in form of ventral valve, form of lateral lobe apices, and armature of internal sac; by larger eye size and smaller interocular ratio; and by positioning of the teeth of the basal elytral gibbosities. Several South American forms are much less distinct and perhaps are conspecific but are here distinguished from *C. crotonae* by having more reduced pronotal markings rather than a nearly continuous central macula.

*Material examined*: Mexico to Costa Rica (Fig. 60) and northern South America, 100. MEXICO. Campeche: head of Río Candelaria,

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PLATE 12. FIG. 51–56, *Ctenocolum* spp., male genitalia: 51, *C. colburni*, median lobe; 52, same, lateral lobes; 53, *C. martiale*, median lobe; 54, same, lateral lobes; 55, *C. crotonae*, median lobe; 56, same, lateral lobes.

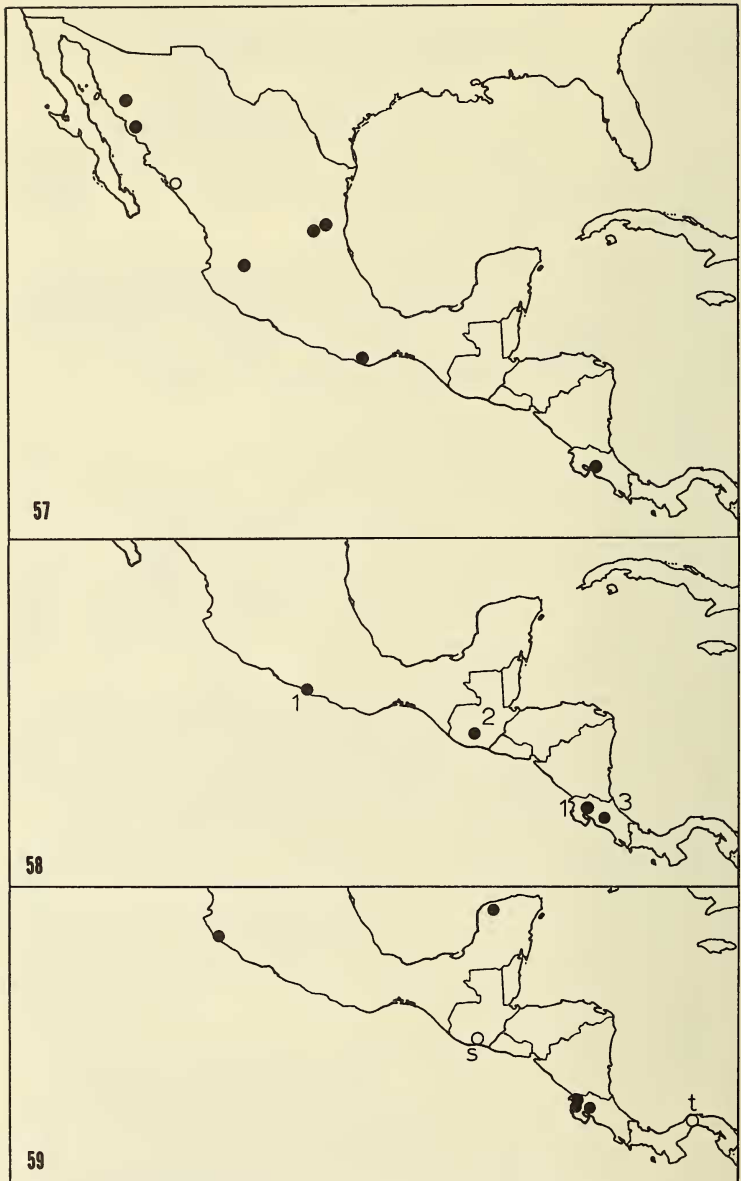


PLATE 13. FIG. 57-59, *Ctenocolum* spp., distribution records in Central America: 57, *C. janzeni* (open symbol = state record); 58, *C. acapulcensis* (1), *C. salvini* (2), *C. biolleyi* (3); 59, *C. tuberculatum* (s = type locality of *serratissimus*, t = type locality of *tuberculatum*).



PLATE 14. FIG. 60-62, *Ctenocolum* spp., distribution records in Central America: 60, *C. crotona* (open symbol = type locality of *pictifemur*); 61, *C. martiale*; 62, *C. colburni*.

Rancho San José, Río San Pedro, 27.VI.1957, O. G. Enriquez #B48 (US), *ex herbarium specimen of Lonchocarpus hondurensis* Benth. Chiapas: Ejido Morelos, La Libertad 60 m., 20.III.1968, M. Sousa #3657 (US), *ex herbarium specimen of Lonchocarpus rugosus* Benth. Jalisco: 34 mi. nw. Barra de Navidad, 9.III.1973, C. D. Johnson #438-73, reared *ex Lonchocarpus nitidus* (Vog.) Benth., emerged by 12.IV-23.VI.1973. Sinaloa: Mazatlan, 14.VIII.1965, H. Burke & J. Meyer. EL SALVADOR. La Unión: Volcan Conchagua, 27-29.V.1958, L. J. Bottimer #101u, reared *ex Lonchocarpus*. San Salvador: San Salvador, 650-850 m., 20.XXI.1921-4.I.1922, P. C. Standley #19254 (US), *ex herbarium specimen of Lonchocarpus rugosus* Benth. COSTA RICA. Guanacaste: La Pacifica, 7 km. n. Cañas, 2.III.1972, D. H. Janzen #VI-20-1972-XXV, reared *ex Lonchocarpus*, emerged by 20.VI.1972; Santa Rosa, 15.III.1972, D. H. Janzen #VI-19-1972-XXVIII, reared *ex Lonchocarpus*, emerged by 19.VI.1972; Santa Rosa, ½ km. from highway, 15.III.1972, D. H. Janzen #VI-19-1972-XXIV, reared *ex Lonchocarpus*, emerged by 19.VI.1972. Puntarenas: 4 km. n. Puntarenas junction, 6.III.1972, D. H. Janzen #VI-20-1972-X, reared *ex Piscidia carthagenensis* Jacq., emerged by 20.VI.1972. VENEZUELA. Distrito Federal: Caracas, 22.XII.1944, interception #EQ#087748 *ex Lonchocarpus margaritensis* Pittier. TOBAGO. Interception #PQ#022305 (Washington) *ex* "seeds of black manoe," 17.VIII.1933. GUYANA. Interception #EQ#A33506 *ex* "seeds of *Peltophorum dosyrachis*," 20.XII.1935; interception (from botanic garden) #EQ#A33506 *ex Lonchocarpus pentaphyllus* (Poir.) DC., 20.X.1935; interception (from botanic garden) #BPQ#030932. BRAZIL. Mato Grosso: Borda da Mato Sertaozinho, 12.I.1960, Medeiros & Pereira. ECUADOR. Intercepted at Honolulu *ex* "tree seeds."

The specimen from "*Peltophorum dosyrachis*" is doubtless mislabelled, as it bears the same quarantine interception numbers as a series from *Lonchocarpus pentaphyllus*.

*Remarks:* There appear to be several closely related forms in the West Indies and South America. The male genitalia of these probably different species differ from the genitalia of *C. crotonae* particularly in structures of the internal sac. Also, dark markings of the pronotum are reduced to a pair of broken longitudinal vittae, rather than confluent or nearly so as in *C. crotonae*.

*Ctenocolum crotonae* is known from more species of host plants than is any other member of the genus, and it is the only species of *Ctenocolum* so far known from more than one host genus. The records of *Lonchocarpus margaritensis* and *L. pentaphyllus* are based on quarantine inspections and need confirmation. Several collections of reared material from undetermined species of *Lonchocarpus* include both *C. crotonae* and *C. tuberculatum*, and one rearing from *Piscidia carthagenensis* included *C. janzeni* as well as *C. crotonae*.

## DISCUSSION

Since several of the Central American species of *Ctenocolum* are known from only one or two localities each, several additional species are likely to be found. Much remains to be learned about the natural history of the genus. We can confidently state only that the genus is restricted to various members of the subtribe Lonchocarpinae (tribe Dalbergiae, family Fabaceae), and that no other New World bruchids are known to use these plants as hosts. We can draw no useful conclusions about geographic relationships, save that the greatest evolutionary activity for both species groups seems to be in Central America and northwestern South America. Similarly, distributional data are of no help in a phylogenetic reconstruction of the relationships of the species.

We recognize two apparently natural species groups, but relationships of their included species are unclear and perhaps cannot be adequately worked out until South American species are studied. The Tuberculatum Group may be defined as monophyletic by having as an apomorphic characteristic a large, complex, symmetric sclerite in the male endophallus. The Crotonae Group may similarly be defined by having the ventral valve of the male median lobe truncate and by having the pecten of the hind femur crescentic in outline.

Within the Tuberculatum Group, *C. tuberculatum* is distinguished by having the eye not sex-dimorphic, the male interocular ratio over 0.20, and the male lateral lobes divided to near the base (probably all plesiomorphous states); and by the ocular sinus deep, with 3 facet rows behind the sinus, and by the male lateral lobes not rolled over at the tips (probably apomorphic states). Perhaps the form of the ocular sinus (deep in *C. tuberculatum*, moderate in *C. janzeni* and *C. salvini*, and shallow in *C. acapulcensis*) is a true morphocline, with the deep sinus a plesiomorphous condition. Among the other three species in Central America, *C. acapulcensis* stands out by having the male antenna flabellate, the ocular sinus shallow and with about 10 facet rows behind the sinus, and the external ventral denticles of the hind femur obsolete. All of these conditions, however, are apomorphic, and the possession of plesiomorphous states of these characters does not indicate an unequivocal relationship between *C. janzeni* and *C. salvini*. The sclerite of the male endophallus is relatively simplified in *C. acapulcensis* and *C. salvini*, perhaps as a synapomorphic condition. Similarly, the eyes are strongly sex-dimorphic in *C. acapulcensis* and *C. janzeni*, an equally plausible synapomorphy.

Among Central American members of the Crotonae Group, *C. colburni* is certainly the most distinctive species and perhaps therefore is the least related, but we have discovered no convincing synapomorphic conditions to relate the other three species. A clue to relationships among *C. crotonae*, *C. martiale*, and *C. biolleyi* lies in the probable morphocline of increasing basal displacement of the outer tooth of the basal elytral gibbosity. Thus, *C. martiale* and *C. biolleyi*, in which this dis-

placement is greatest, are probably the most closely related species of the Crotonae Group.

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